

A framework for sustainable supply networks: the role of indirect suppliers in a firm's pursuit of sustainability

Samuel Roscoe (samuel.roscoe@postgrad.mbs.ac.uk)

Manchester Business School, Operations and Supply Chain Management Department

Prof. Paul Cousins

Manchester Business School, Operations and Supply Chain Management Department

Prof. Richard Lamming

Honorary Visiting Professor, Manchester Business School, Operations and Supply Chain Management Department

Abstract

Existing Sustainable Supply Chain Management frameworks attempt to incorporate each tier of the end-to-end supply chain. However, the firm or buyer-supplier dyad is predominately used as a unit of analysis, leaving a gap regarding how indirect suppliers affect firm sustainability. To fill this gap we pose two research questions: What role do indirect suppliers play in firm sustainability? And; how can firms access innovations possessed by indirect suppliers? We conduct a literature review and utilize a conceptual theory building methodology. Using a network lens we explain how indirect suppliers affect firm sustainability and advance a framework for Sustainable Supply Networks.

Keywords: Sustainability, Supply Networks, Innovation

Introduction

Fully understanding a company's sustainability profile requires a view of not only the company's direct suppliers but also the wider network in which it operates (Miemczyk et al. 2012). Corporate sustainability is defined as voluntary company activities which demonstrate the inclusion of social and environmental concerns in business operations and in interactions with stakeholders (van Marrewijk, 2003 pg. 102). A trend of the past three decades is for firms to focus on core competencies and outsource non-strategic activities to suppliers (Prahalad and Hamel, 1990). The result is suppliers having a significant impact on the environment through the generation of emissions and waste during raw material extraction, manufacturing and distribution and on society by employing labour from communities in emerging markets. Oftentimes, a firm's direct suppliers subcontract parts of the production process to a second or even third tier of indirect suppliers. Each time the firm loses a modicum of control and visibility over the environmental and social activities of its extended supply network.

Take for example the social impact created by the collapse of Rana Plaza, a textile manufacturing facility in Bangladesh, which killed more than 1,100 garment workers (the Wall Street Journal, 2013a). The factory owners were lambasted for using substandard building materials and failing to comply with building regulations (the Wall Street Journal, 2013b). Rana Plaza was acting as a subcontractor for major retailers such as the Gap and Wal-Mart. Wal-Mart subsequently announced it would introduce new safety measures at its Bangladeshi factories (New York Times, 2013). Indirect suppliers have also been fingered for causing substantial environmental damage. During the Gulf of Mexico oil spill in 2010 BP attempted to shift blame to Transocean, the owner of the drilling platform, who in turn blamed Halliburton its cement supplier. Despite the finger pointing, the result was an immediate fall in BP's share price and the setting aside of \$41 billion to settle claims (bbc.co.uk, 2010; 2012).

These examples illustrate how indirect suppliers can significantly impact the sustainability profile of the firm. Sustainable Supply Chain Management (SSCM) stresses the importance of considering the extended supply chain including both direct and indirect suppliers (see Seuring and Muller, 2008; Carter and Rogers, 2008). However, SSCM research has tended to adopt the firm or the dyadic relationship between a buyer and its direct suppliers as a unit of analysis (Seuring, 2011; Miemczyk et al. 2012). This leaves a gap in our understanding of how indirect suppliers affect firm sustainability. To fill this gap we pose two research questions: 1) What role do indirect suppliers play in firm sustainability and; 2) how do firms access the innovations possessed by indirect suppliers? To answer these questions we adopt a network perspective and use a large scale literature review and conceptual theory building methodology (Meredith, 1993; Weick, 1989). In so doing we advance a framework for Sustainable Supply Networks.

The paper is divided into four sections. We start by reviewing two prominent theories of the firm and provide a rationale for selecting the Resource Based View as an overarching theoretical lens. In the second section we advance five propositions. We draw on the Natural Resource Based View (NRBV) to posit that more innovative firms will have a higher propensity to be sustainable. We use Network Theory and the Knowledge Based View (KBV) to postulate that firms which build a multitude of ties with direct and indirect suppliers will be more likely to discover innovations. We then

use Network Theory to hypothesize that creating bridging weak ties to indirect suppliers will lead to new ideas and innovations. Next, we propose that adopting a process of open innovation will enhance the likelihood of finding innovations in the supply network. Finally, we argue that to effectively manage the supply network firms should grasp the concept of structural embeddedness. We conclude by discussing the research and managerial implications, highlight the paper's shortcoming and outline future avenues for research

Resource Based Rationale of Supply Networks

In this section we compare two prominent theories of the firm: the Resource Based View and Transaction Cost Economics. The aim is to find an overarching theoretical lens which explains why supply networks form, the structure of these networks and the behaviour of network actors. Networks are essentially a number of interconnected exchange relationships (Cook, 1977; Cook et al. 1983). When two or more actors voluntarily exchange resources for mutual benefit an exchange relationship is formed (Cook, 1977). If each actor has a resource valued by every other actor and if the ties between the actors represents an opportunity to exchange these valued resources, then the pattern of ties create an exchange opportunity structure (Cook et al. 1983). With time, these opportunity structures develop into networks of connected exchange relations (ibid). A network differs from a firm in that it does not consist of an authority relationship that can enforce an organizational structure on its members (Kogut, 2000). In fact, the structure of a network arises from inherent characteristics of technologies that populate an industry, as well as social norms and institutional factors that favour the operation of particular rules (ibid). As these rules generate the structure of a network, the structure itself influences subsequent behaviour (ibid).

A supply network is defined as the network of companies that exist upstream to any one company in the value system (Choi and Krause, 2006 p. 639). A supply network is essentially an exchange network between a firm and its direct and indirect suppliers. As with an exchange network, supply networks can be viewed as complex adaptive systems with no single company deliberately orchestrating the totality of its design (Choi et al., 2001). The structure of a supply network forms over time through the constant interaction between a firm and its direct and indirect suppliers. The structure then influences the behaviour of each actor in the network.

Two prominent theories in the management literature attempt to explain the nature of the firm and what motivates the firm to interact with other actors: Transaction Cost Economic (TCE) and the Resource Based View (RBV). According to Coase (1937) a firm will tend to expand until the costs of organising an extra transaction within the firm becomes equal to the costs of carrying out the same transaction by means of an exchange on the open market or the costs of organising in another firm (pg. 341). TCE states that a firm's decision to make a product in-house or purchase it from the market centres on minimizing the sum of transaction costs and production costs (Coase, 1937; Williamson, 1975). With regards to supply networks, TCE would argue that firms enter into supplier relationships when the cost of purchasing a product from a supplier is lower than the cost of making the product internally.

In contrast to the transaction cost logic, which emphasizes cost minimization, the RBV stresses value maximization by the firm through pooling and utilizing valuable resources (Penrose, 1959; Das and Teng, 2000). Firm value is maximized through

gaining access to other firms' valuable resources (Madhok, 1997). The RBV holds that the type, magnitude, and nature of a firm's resources are important determinants of its profitability (Penrose, 1959). Resources can be defined as those tangible and intangible assets which are tied semi-permanently to the firm including: brand names, in-house knowledge of technology, employment of skilled personnel, machinery and efficient procedures (Wernerfelt, 1984). Penrose believed that competitive advantage is conferred by the complementarities of these resources particularly if they are hard to imitate and scarce. Barney (1991) expanded this idea stating that if the firm's resources are valuable, rare, inimitable and non-substitutable then competitive advantage can become sustained in the longer term

The notion of valuable and scarce resources fits well with network theory which states that the formation of exchange relations occurs for two reasons: specialization and scarcity (Cook, 1977). Resource scarcity pushes a firm to restrict its activity to specific functions resulting in that firm having to exchange with other specialized companies to obtain valuable resources (Levine and White, 1969; Cook, 1977). As such, the trading and accumulation of resources within a network becomes a strategic necessity. Applying these concepts to supply networks we see that as firms focus on core competencies and outsource non-strategic activities exchange relationships with suppliers must be established to access scarce and valuable resources. The structure of the supply network then takes shape due to a constant exchange of valuable resources between the firm and its suppliers.

A comparison of these two theories makes clear that TCE does not fit with many of the underlying concepts of networks. Specifically, TCE does not explain the exchange and accumulation of valuable resource like when a firm co-develops a technology with a supplier to address pollution or worker welfare in the supply network. TCE has difficulty explaining this exchange as it does not minimize transaction or production costs, in fact, it may actually increase costs for the firm. In contrast, the RBV would view this exchange as a value maximization activity as it has the potential to enhance the sustainability profile of the firm. Moreover, the RBV explains the nature of resources and accounts for situations where firms maximize value over minimizing costs. The RBV makes clear that firms form supplier relationships to access scarce resources and to utilize these resources to enhance firm value. Therefore, we adopt the RBV as an overarching theoretical lens for the following examination of Sustainable Supply Networks.

Innovation as a Driver of Sustainability

Using the Resource Based View, we now investigate the various aspects of Sustainable Supply Networks. To do so, we draw on several other theories which either originate from the RBV (see the Natural Resource Based View and the Knowledge Based View) or share commonalities (see Network Theory). We draw on the Natural Resource Based View to postulate that innovation is a key driver of sustainability. We then use the Knowledge Based View to discuss the importance of knowledge-sharing in New Product Development and innovation and return to Network Theory to explore various methods for accessing innovation in supply networks.

The Natural Resource Based View (NRBV) argues the inevitability of business being constrained by and dependent upon nature and suggests that a firm's strategy should be rooted in capabilities that facilitate environmentally sustainable economic activity. In

fact, NRBV sees innovation as a key driver in sustainability and proposes five strategies which can enhance firm sustainability. One such strategy is pollution prevention which utilizes technology that prevents harmful emissions at the front end of the process rather than relying on expensive end-of-pipe pollution control devices. Similarly, clean technology strategies use innovations which reduce material and energy consumption through technological advancements that provide for human needs without straining the planet's resources (Hart, 1995, Hart and Dowell, 2011). Other authors have reached similar conclusions about the importance of innovation in firm sustainability. For example, Klassen and Vereecke (2012) found that innovation was crucial in improving the management of social aspects of the supply chain. They stressed the importance of obtaining social innovation capabilities which include the development of new markets and the identification of novel approaches to cost reduction by involving stakeholders from outside the established supply chain (Klassen and Vereecke, 2012).

Moreover, many firms have put innovation at the centre of their sustainability strategies. Nike fell victim to a media and consumer backlash in 2000 when reports of child labour at a supplier's facility in Cambodia became front page news (Cousins et al., 2008). Nike now addresses social issues using innovative processes such as incentivizing suppliers to comply with the Fair Labour Association's "fair wage" approach and reducing excessive working hours (www.nikeresponsibility.com, 2013). Supplier collaboration resulted in innovative uses of environmentally friendly materials which incorporate advances in recycled content, sustainable cotton, and expanded green rubber formulations. Nike states: "Sustainability is the world's greatest innovation challenge: sustainability requires transformation, and innovation lies at the heart of that process" (ibid). By drawing on the NRBV and utilizing examples from industry we propose the following:

Proposition 1: Firms that develop innovative products and processes have a higher propensity to be sustainable than firms that do not.

Discovering innovation

The Knowledge Based view states that knowledge is the most strategically important resource of the firm (Grant, 1996). Knowledge can take two forms, explicit, which can be written down and tacit which cannot. Tacit knowledge is acquired by and stored within individuals. Clark and Fujimoto (1991), state that new product development and innovation involve especially wide ranging knowledge integration. In fact, innovation has been defined as the process of making changes to products, processes, and services that results in new value creation to the organization and its customers by leveraging knowledge efforts of the firm and (or) that of its supply network partners (Narasimhan and Narayanan, 2012 p. 28). The SI-NPD literature calls for close collaboration and knowledge-sharing between the firm and a few strategic partners in the search for innovation. Some authors go so far as to argue that tempting suppliers into a NPD project requires a reduction of the supply base (i.e. Shin et al., 2000). After reducing supplier numbers it is suggested the few remaining suppliers become highly integrated into the firm's products or processes. The underlying assumption is that SI-NPD provides higher product innovation levels because knowledge and technology spill-over from the supplier to the firm (Mayer, 2006; Koufteros et al., 2007; Perols et al., 2013).

However, the network literature takes quite a different view on how to access innovations. Broadly, the network literature states a firm should not limit its ties to a

handful of strategic partners but create a multitude of ties to enhance the opportunity for finding innovations. Ahuja (2000), states that each additional actor that a firm has access to serves as an information-processing mechanism, absorbing, sifting, and classifying new technical developments; going well beyond the information-processing capabilities of a single firm. He also discovered that the greater the number ties possessed, the greater the subsequent innovation output of the firm (ibid). Fox et al., (2013) found that organizations connected to many partners are expected to be more innovative than those connected to fewer. Shan et al., (1994) established that the number of collaborative relationships that a firm formed was positively related to its innovation output. As such we propose the following:

Proposition 2: Firms that create a multitude of ties with direct and indirect suppliers will be more likely to discover innovations than firms that do not.

Building Bridging Weak Ties

Network Theory explains that the creation of certain types of ties may increase the likelihood of discovering innovations. Granovetter (1973) states the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie. He goes on to explain that our acquaintances (weak ties) are less likely to be socially involved with one another than are our close friends (strong ties) (Granovetter, 1973; 1983). The set of people made up of any individual and his or her acquaintances comprises a low-density network whereas the set consisting of the same individual and his or her close friends will be densely knit (Granovetter, 1973). When two densely knit clumps of strong ties are not connected a “structural hole” is present in the network (Burt 1992, 2004). Burt (2004) suggests that people who stand near the holes in a social structure are at higher risk of having good ideas because people’s opinions and behaviours are more homogeneous within groups than between groups. Therefore, people connected across groups are more familiar with alternative ways of thinking and behaving providing more options to select from and synthesize (ibid). These structural holes are bridged by the creation of weak ties (Granovetter, 1983, Burt, 2004). Firms that build bridging weak ties across structural holes in the network occupy powerful brokerage positions as they arbitrate the information flows between densely knit clumps of strong ties (Burt , 2004, Kogut, 2000).

Applying this concept to supply networks we see an incentive for a firm to look beyond its densely knit clump of direct suppliers to form bridging weak ties with indirect supplier. Spanning these structural holes provides access to new ideas and technologies. As such, we argue that firms should actively seek to build bridging weak ties to indirect suppliers as new information and exciting ideas will be more readily available. These ideas can then be appropriated by the firm and turned into useful innovations. This leads to the third proposition:

Proposition 3: Firms that create bridging weak ties to indirect suppliers will have a higher propensity to discover innovations than firms that do not

Opening Up To Innovation

The preceding discussion makes clear that innovations which address sustainability issues often rest outside of the boundaries of the firm. Looking beyond a firm's boundaries for innovation is a process called "Open Innovation". Open innovation is defined as a paradigm that assumes firms can and should use external and internal ideas and paths to market as they advance their technology (Chesbrough et al, 2006). Firms adopting an open innovation process actively seek to collaborate with other network actors to develop or absorb new technologies, commercialize new products, or stay in touch with the latest technological developments (Vanhaverbeke, 2006). Instituting open innovation in the supply network allows the firm to engage with direct and indirect suppliers in knowledge sharing and technology development. These innovations can then be implemented to enhance the sustainability profile of the wider network. It can thus be posited that firms which develop a mindset of being open to outside innovation will have a higher propensity to discover innovations which enhance sustainability than firms that do not. This leads to the fourth proposition:

Proposition 4: Firms that adopt a process of open innovation will have a higher propensity to be sustainable than firms that do not

Understanding Structural Embeddedness

Upon identifying a supplier innovation the firm needs to effectively manage the supplier to ensure it is properly implemented. The supply network literature argues that too often firms evaluate and manage a supplier as if it exists in isolation and states firms should consider the performance of both direct and indirect suppliers (Choi and Kim, 2008). By adopting a network lens we can conceptualize firms, and their suppliers, as embedded within a larger network, a concept called structural embeddedness. Structural embeddedness refers to the embeddedness of actors within the overall structural form of their socially constructed environment (Granovetter, 1985; 2005). The basic premise is that the structure of, and behaviours in, the network influences the actor behaviours and outcomes in the network (Tate et al., 2013).

By applying the concept of structural embeddedness to supply networks we see that a firm should consider a direct supplier's extended supply network to arrive at a more complete evaluation of that supplier's performance (Choi and Kim, 2008). In so doing, the firm is better able to select suppliers for long-term relationships. Moreover, the firm can find value in maintaining relationships with poorly performing suppliers who have the potential to act as a conduit to indirect suppliers with technological and innovative resources (ibid). Choi and Kim, (2008) go so far as to state that firms with a good understanding of their suppliers' structural embeddedness are likely to perform better at supplier management than those without such an understanding (ibid). This leads to the fifth proposition:

Proposition 5: Firms that have an understanding of their direct suppliers' structural embeddedness will have a higher propensity to be sustainable than firms that do not

Having explained the nature and structure of sustainable supply networks and argued that innovation is a key driver in firm sustainability we now advance a definition for Sustainable Supply Networks:

A web of inter-organizational relationships where innovative products and processes are developed between a firm and its direct and indirect suppliers to enhance the environmental, social and economic performance of each actor and the network as a whole.

Discussion

van Bommel (2011) states that an integral approach needed to understand the implementation of sustainability in supply networks is hardly to be found. The Sustainable Supply Network framework advanced here is a preliminary step in that direction. It is important to note that the authors do not claim to advance a fully formed theory but merely a framework. Dubin (1969) states that a theory: 1) allows prediction or increased understanding; 2) is interesting (i.e. non-trivial); 3) Includes attributes or variables and their interactions; 4) Does not include "composite" variables (i.e. variables which include a number of other variables, elements, or attributes which are undefined); 5) includes boundary criteria. This paper meets the first criteria as it advances five propositions which allow for prediction and future testing by academics in empirical studies. The paper meets the second criteria, in that it is interesting. Specifically, we go beyond mere hypothesis building and illustrate how innovation is a key driver in firm sustainability and how understanding structural embeddedness helps in supplier management. The paper meets the third criteria as it provides definitions of key variables such as sustainability and innovation and shows how they interact within the network. However, the paper falls short on meeting the last two criteria as it does not explore composite variables and does not define the boundary criteria for sustainable supply networks. As Meredith (1993) explains any conceptual model which includes epistemic propositions or explanatory elements, yet does not fulfil all five of the theory requirements, is classified as a framework or pre-theory (Naumann 1984; Meredith, 1993).

Shortcomings of existing research

The primary shortcoming of this paper is that the propositions are based on existing literature and have not been empirically tested. Campbell (1974) states that the transition from framework to formal theory occurs as "frameworks are tested against reality until they are eventually developed into theories as research study builds upon research study" (p. 415). Our hope is that our research will stimulate additional theory-building and conceptual development within the supply chain management discipline. Given the early development of the framework, the propositions should be considered very tentative, and should be subjected to further refinement through both qualitative and quantitative research methods. A second shortcoming is the distinct focus on suppliers to the exclusion of other stakeholders. This paper has been restricted to suppliers as inclusion of all stakeholders would far exceed the conferences space limitations. As such, an important area of future study is the role of stakeholders in Sustainable Supply Networks. The use of Stakeholder Theory to investigate how stakeholders influence the activities of indirect and direct suppliers in a firm's pursuit for sustainability could prove particularly interesting.

Research and Managerial implications

The framework should be of interest to academics as it builds on existing SSCM frameworks to incorporate indirect suppliers. By adopting a network, as opposed to chain, perspective academics are provided with a lens to perceive innovation as resting with indirect suppliers outside of the firm's homogeneous cluster of direct suppliers.

This paper should prove valuable to managers because it challenges the assertion of the SCM literature that innovation is accessed through high levels of supplier integration and instead argues for the creation of multiple ties with direct and indirect suppliers. Further, the paper suggests managers should focus on building bridging weak ties to indirect suppliers to gain access to exciting new ideas and technologies. Finally, the paper highlights the significance of understanding the concept of structural embeddedness, allowing managers to look past direct suppliers to the impact that indirect suppliers have firm sustainability.

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